AbstractID: 9058 Title: Use of optimized oblique anatomical planes for efficient and accurate organ and tumor segmentation

Purpose:
To improve the efficiency and accuracy of tumor and normal organ segmentation by using optimized anatomical planes.

Method and Materials:
Contouring of tumors and normal organs is typically conducted using transverse computed tomography (CT) planes. This is due to the historical relationship between diagnostic radiology and radiation oncology, as well as the relatively poor longitudinal spatial resolution of CT relative to the transverse plane. We hypothesize that the accuracy and efficiency of segmentation will be improved if the contouring planes are aligned to anatomical landmarks and planes, similar to the methods used in surgery. This advance is made possible by the state-of-the art in CT systems that provide high spatial-resolution images that do not bias the resolution in favor of the transverse plane. This program has three phases: 1) Design an algorithm that generates contour surfaces from nonparallel obliquely oriented contours. 2) Select oblique planes corresponding to surgical exposure techniques and evaluate the improved efficiency of segmentation using a custom-generated organ surface library. 3) Develop a contouring toolset that includes tools to aid in navigating the CT dataset in 3 dimensions.

Results:
Phase 1 has been completed. Phase 2 is underway, with data from parotid segmentation showing progress for selecting anatomical planes similar to a superficial parotidectomy. Toolsets are being developed for phase 3, including methods for aligning the contouring plane with the anatomical reference landmarks as used in surgery.

Conclusion:
This process promises to provide a more efficient and effective method for manually segmenting structures based on the hypothesis that aligning the contouring planes to anatomical landmarks and structures will provide a more accurate segmentation process, and allow radiation therapy to be delivered with similar anatomical precision as surgical therapy. We anticipate this will be especially true for nodal target volumes.